High Performance PMD, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

To achieve the full potential of PMD/LAD technology for high performance space exploration missions mass reduction is essential. Screen channel acquisition devices are an interesting approach for future spacecraft using cryogenic propellants. However, traditional manufacturing techniques (i.e. metal-based) are heavy and have reliability issues. To achieve desired mass savings and screen reliability, GTL proposes to develop a high-performance PMD/LAD using advanced composite materials technology based upon their innovative BHL™ composite cryotank technology. GTL's BHL technology provides a 75% mass savings compared to equivalent state-of-the-art metal cryotanks. In this Phase I effort, GTL will design and fabricate screen samples. These screens will be cryogenically thermally cycled and tested for their performance and reliability. A proof-of-concept BHL composite channel arm will be designed and fabricated to demonstrate the manufacturing process and provide mass data. The Phase I effort will conclude with an examination of integration into GTL's high performance 4 ft diameter BHL spherical cryotank. During the phase II effort, a developmental version of the composite PMD/LAD will be fabricated and tested to verify its performance. The Phase II effort will conclude with the fabrication of a prototype sherical cryotank with an integral composite PMD/LAD. Operational testing will advance the technology readiness to TRL 6, which will open the way for the technology to be used in upcoming space exploration missions.

Anticipated Benefits

The implementation of GTL's ultralight composite PMD/LAD technology will further progress NASA space mission goals. The reduced mass savings offered will improve space vehicle performance, offering opportunities to increase propellant stores. The mass savings offered through use of GTL's technology also offers increased payload capability. In addition, the use of a composite structure over traditional metal increases mission safety by reducing the potential for gas leakage and permeation.

DoD organizations will benefit from implementation of this technology into their propellant tanks for conduction of high-performance space missions/operations. In addition, commercial ventures that are ever seeking to push the envelope on space capabilities would further their goals by incorporating this technology into their vehicles. The weight savings and increased reliability offered by this technology would be invaluable addition to any space mission seeking increased performance.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Gloyer-Taylor Laboratories LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

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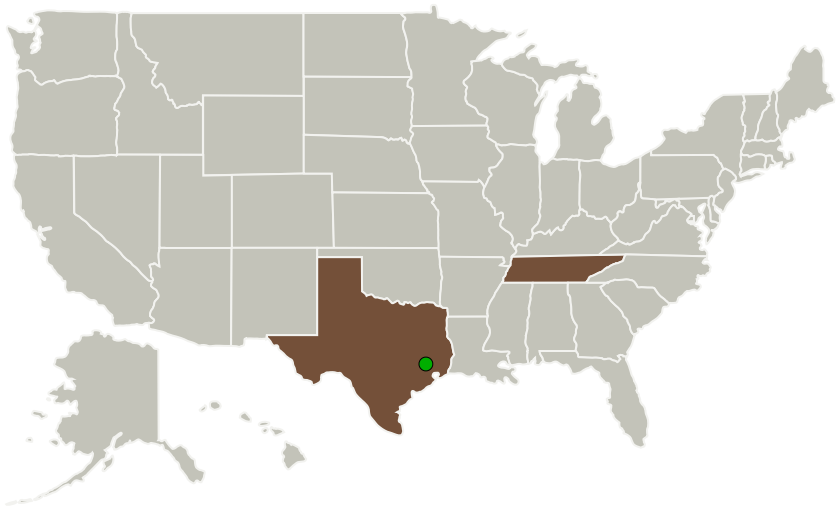
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Gloyer-Taylor Laboratories LLC	Lead Organization	Industry	Tullahoma, Tennessee
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Tennessee	Texas

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141355)*

Project Management *(cont.)*

Program Manager:

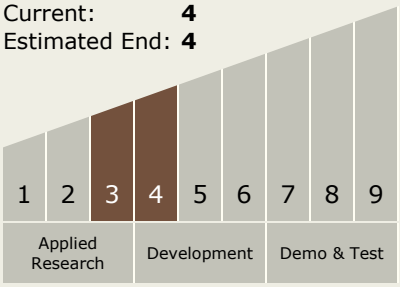
Carlos Torrez

Principal Investigator:

Zachary Taylor

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Moon, Mars

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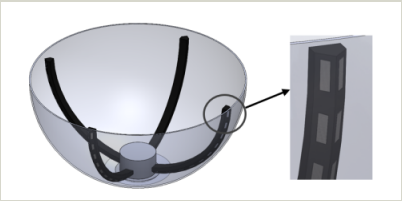
Images

Briefing Chart Image
High Performance PMD, Phase I
(https://techport.nasa.gov/image/135823)



Final Summary Chart Image
High Performance PMD, Phase I
(https://techport.nasa.gov/image/131782)